Assessment of Data Availability and Adequacy for Estimating Contaminant Losses for CAD Cell Alternatives

Reports

Reviewed reports (supplied by the New England District) include:

1. Technical Memorandum, Preliminary CAD Cell Volume Capacity Analysis. 2006. Apex Companies and Jacob Engineering Group.

2. Draft CDF C Groundwater Model Technical Memorandum. 2001. Foster Wheeler Corp.

3. 12-Volume Engineering Feasibility Study (1988-89, pertinent volumes only).

4. New Bedford, Sawyer Street Quarterly Groundwater Sampling, Analytical Results, March 1992 - March 2001.

5. Quarterly Sampling at Sawyer Street CDF, October 2004-October 2006. 2006. ENSR/AECOM.

6. Overview of the New Bedford Harbor Physical/Chemical Modeling Program, April 1, 1991 (available at www.epa.gov/ne/nbh).

7. Volumes, Areas and Properties of Sediment by Management Units. 2003. Foster Wheeler report.

Other technical reports and background information obtained at:

http://www.epa.gov/ne/nbh/techdocs.html

Modeling Approaches for Modeling Short- and Long-Term Contaminant Losses from Dredged Material Disposal in a CAD Cell

Short-Term Modeling (pre-capping): Processes and Applications of STFATE, SURGE, PSDDF, RECOVERY/CAP and Hydrodynamic Models

Dredged Material Placement: STFATE and SURGE applications

Data Needs: Bathymetry, cell description (size, length, width, depth, side slopes and roughness), density profile, velocity in CAD cell, dredged materials descriptions (water contents, specific gravities, grain size distributions, Atterberg limits, settling characteristics and critical

shear velocity as a function of grain size), disposal operation description (barge type, barge size, barge draft, disposal discharge duration per barge, and disposal frequency), standard elutriate tests results and bulk sediment chemistry of sediments particularly for PCBs and copper

Water Column Exchange: Hydrodynamic model application

Data Needs: Calibrated and verified hydrodynamic model and hydrodynamic predictions of exchange rates across opening of CAD cell for range of site conditions (tides, wind, storm, wave and traffic)

Dredged Material Consolidation: PSDDF application

Data Needs: Dredged materials descriptions (water contents, specific gravities, grain size distribution, Atterberg limits, consolidation characteristics from standard oedometer test consisting of void ratio-effective stress relationships for range of dredged materials and void ratio-permeability relationships for range of dredged materials), foundation permeability, regional groundwater model (if foundation is permeable) and pressure head in foundation underlying CAD cell, foundation consolidation properties (if compressible), sediment volumes by type, fill sequence, disposal plan and schedule

Diffusion and Advection of Contaminants from Dredged Material: RECOVERY/CAP application

Data Needs: Bulk sediment concentrations, TOC concentrations, DOC concentrations, specific gravities, water contents, sediment-specific partitioning characteristics, leachable (labile) fractions for copper, groundwater seepage rates through fill, sediment volumes, fill sequence, disposal plan and schedule

Long-Term Modeling (post-capping): Processes and Application of PSDDF and RECOVERY/CAP Models

Dredged Material Consolidation: PSDDF application

Data Needs: Dredged materials and capping materials descriptions [water contents, specific gravities, grain size distribution, Atterberg limits, consolidation characteristics from standard oedometer test consisting of void ratio-effective stress relationships for range of dredged materials and capping materials (if fine-grained) and void ratio-permeability relationships for range of dredged materials and capping materials (if fine-grained)], foundation permeability, regional groundwater model (if foundation is permeable), pressure head in foundation underlying CAD cell, foundation consolidation properties (if compressible), cap design, sediment volumes by type, fill sequence, disposal plan and schedule

Diffusion and Advection of Contaminants from Dredged Material: RECOVERY/CAP application

Data Needs: Cap design, bulk sediment concentrations, TOC concentrations, DOC concentrations, specific gravities, water contents, cap- and sediment-specific partitioning characteristics, leachable (labile) fractions for copper, groundwater/pore water seepage rates through fill, sediment volumes, fill sequence, disposal plan and schedule

DATA NEEDS:

Sediment Data:

Number of materials/classes/types

For each material:
- Volume
- Order of Disposal/Schedule
- Bulk sediment concentration
- Labile fraction
- TOC
- DOC
- Standard elutriate test results
- Partitioning coefficient
- Water content
- Specific gravity
- Grain size distribution
- Atterberg limits
- e-log P relationship
- e-log K relationship

Hydrodynamic/Site Data:

Currents:
- Typical
- Prevailing
- Peak
- Storm

Waves:
- Height
- Frequency or length

Bathymetry:
- Depths
- Tidal ranges

Salinity:

Profile

Groundwater Data and Foundation Properties (if foundation is permeable or compressible):

Regional groundwater model
Seepage velocity
Pressure head in foundation underlying CAD cell
Foundation permeability
Foundation consolidation properties

Disposal Operation Data and Disposal Plan/Schedule:

Operation description
Sequence of MUs
Production rate
Equipment sizes
Vessel draft
Bucket size
Excavator reach

Cap/CAD Design:

Layers
Thicknesses
Material properties:
- Consolidation
- Permeability
- Specific gravity
- Porosity
- TOC
- Partitioning coefficients

DATA AVAILABILITY AND ADEQUACY			
Parameter	**# of Values**	**Sources**	**Adequacy**
CAD Water PCBs Concentration	3, many during dredging	Technical Report EL-88-15: Report 3; Battelle WQ 2007; 1998 ROD	OK but most data associated with dredging
CAD Water Cu Concentration	3, some during dredging	Technical Report EL-88-15: Report 3; 1998 ROD	OK but most data associated with dredging
Sediment Data	Management Units???		
Sediment PCBs concentration	2 (hot spot and midrange); 57; many others	Technical Report EL-88-15: Report 3 Technical Report EL-88-15: Report 11; Battelle Sediment 2007; 2003 FW Database; 2003 FW Report; 1996 Baseline; 1998 ROD	OK
Sediment Cu concentration	2 (hot spot and midrange); others	Technical Report EL-88-15: Report 3 Technical Report EL-88-15: Report 11; 1996 Baseline; 1998 ROD	Needed, Should be in 1993 sampling data that would be OK
Pore water PCBs concentration	2 (anaerobic and aerobic midrange)	Technical Report EL-88-15: Report 5 Technical Report EL-88-15: Report 11	Limited
Pore water Cu concentration	1 (anaerobic midrange)	Technical Report EL-88-15: Report 5 Technical Report EL-88-15: Report 11	Limited
TOC	1 (anaerobic midrange); 57; other OM	Technical Report EL-88-15: Report 3; Battelle Sediment 2007; 2003 FW Report (organic content, not TOC)	OK
DOC	2 (anaerobic and aerobic midrange)	Technical Report EL-88-15: Report 5	Limited
Cu labile fraction	Maybe 1 can be estimated	Technical Report EL-88-15: Report 5	Limited but may be determined from 1993 sampling/ 1996 baseline
Cu partitioning coefficient	Maybe 1 can be estimated	Technical Report EL-88-15: Report 5 Technical Report EL-88-15: Report 9	Very limited

DATA AVAILABILITY AND ADEQUACY (continued)			
PCBs partitioning coefficient	Separation sample, Estuary composite sediment sample, representing midrange PCB conc in the Upper Estuary portion of the Acushnet River, under aerobic and anaerobic conditions	Estes dissertation Technical Report EL-88-15: Report 5	Limited, Do we need congener-specific values? Oil & Grease impacts?
Standard elutriate test results	2, hot spot and midrange	Technical Report EL-88-15: Report 3	Representative?
Water content	1 (midrange composite); numerous moisture contents	Technical Report EL-88-15: Report 3; 2003 FW Report	OK ,Water content? Needs check of consistency with solids content
Specific gravity	2 (hot spot and midrange); many others	Technical Report EL-88-15: Report 3; 2003 FW Report	OK
Grain size distribution	2 (hot spot and midrange); 57; many size fractions	Technical Report EL-88-15: Report 3; Battelle Sediment 2007; 2003 FW Report	OK
Atterberg limits	2 (hot spot and midrange); numerous but misreported	Technical Report EL-88-15: Report 3; 2003 FW Report	Need clarification of 2003 Data, Plasticity Index? Should be in percent
e-log P relationship			Needed
e-log K relationship			Needed
Volume			MUs volumes?
Order of Disposal/Schedule			Needed?
Hydrodynamic Data/Model	CAD, RMA-2V and RMA-4; TEMPEST/FLESCOT	Technical Report EL-88-15: Report 2 Battelle 1991	OK?
Bathymetry Data	limited	Technical Report EL-88-15: Report 2	OK?
Density/Salinity Data	limited	Technical Report EL-88-15: Report 2	OK

DATA AVAILABILITY AND ADEQUACY (continued)			
Groundwater Data/Model			Needed?
Foundation Properties		Apex/Jacobs 2006	Need Permeability and Compressibility, if fine-grained
Disposal Operation Data			Needed
Disposal Plan/Schedule			Needed
CAD Design		Apex/Jacobs 2006	OK
Cap Design			Needed